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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/606,976

06/25/2003

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XENOP009

6444

58766

7590

05/07/2009

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EXAMINER

GUPTA, VANI

ART UNIT

PAPER NUMBER

3768

MAIL DATE

DELIVERY MODE

05/07/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/606,976	<b>Applicant(s)</b> STEARNS ET AL.	
	<b>Examiner</b> VANI GUPTA	<b>Art Unit</b> 3768	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 27 January 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-40 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-40 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                        |                                                                   |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>1/27/2009</u> .                                               | 6) <input type="checkbox"/> Other: _____                          |

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## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

***1. Claims 1, 3, 4, and 26 – 34 are rejected under 35 USC 103(a) as being obvious over Sevick-Muraca et al. (US 5,865,754) in view of Baron (US 5,867,250).***

**Regarding claims 1, 3, 4 and 26 – 34, *Sevick-Muraca et al.* (hereinafter *Sevick-Muraca*)** discloses a method for obtaining a three-dimensional representation of a light source distribution located inside a mammal, the method comprising:

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(a) obtaining a topographical surface representation; and (b) providing surface light image data from light emitted from a surface of the mammal originating from the light source distribution located inside the mammal (*col. 2, line 32 – col. 3, line 2*); and (c) using a processing system (**fig. 1, 160**), reconstructing a three-dimensional representation of the light source distribution internal to the mammal using the surface light emission data (*col. 4, line 67 – col. 7, line 53*).

Sevick-Muraca differs from Claim 1 in that Sevick-Muraca *also* does not disclose using the surface topographical representation with the surface light emission data, to reconstruct a three-dimensional representation of the light source distribution internal to the mammal.

Nonetheless, Baron establishes relationship between the topographical surface representation and surface light emission data (*col. 5, lines 5 - 27*). Since the surface representation data of Baron comprises the surface topography data and the surface light emission data with respect to the incident light beams from the fluorescing points *within* the mammal (internal fluorescent emission data); when one generates three-dimensional surface image data from the two-dimensional *surface* representation data, as is known to those of ordinary skill in the art, one is also generating three-dimensional representation of the light source internal to the mammal. Baron explains that this data is generated with the use of a computer, which would inherently include some type of processor.

Therefore, it would have been *prima facie* obvious to modify Sevick-Muraca with Baron to include a establishing a relationship between a surface topography and light emission data of a mammal so that one could analyze the three-dimensional representations of the light source distribution internal to the mammal digitally, in a rapid and efficient manner.

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With respect to obtaining a three-dimension representation of a light source distribution located inside a mammal while performing the steps thereof, please see Baron.

**2. *Claims 5 – 10 and 16 – 20 are rejected under 35 USC 103(a) as being obvious over Sevick-Muraca et al. (US 5,865,754) in view of Baron ((US 5,867,250), as applied to Claim 4 above; and claims 35 – 40 are rejected under 35 USC 103(a) as being obvious over Sevick-Muraca et al. (US 5,865,754) in view of Baron ((US 5,867,250), as applied to Claim 1 above; all in further view of Ntziachristos et al. (6,615,063 B1) .***

**Regarding Claim 5**, Sevick-Muraca in view of Baron discloses a method for obtaining a three-dimensional representation of a light source distribution located inside a mammal, as presented above.

However, Sevick-Muraca in view of Baron differs from Claim 5 in that Sevick-Muraca in view of Baron does not specifically appear to disclose creating a set of volume elements, or voxels.

Nonetheless, Ntziachristos teaches fluorescence-mediated molecular tomography, wherein diffraction tomography segments the volume under investigation into a number of discrete voxels, or volume elements, into a “mesh” (col. 10, line 34 - col. 11, line 18). Ntziachristos also teaches a cost-efficient invention that enables three-dimensional localization in deep tissues and quantization of molecular probes (Abstract; col. 2, lines 34 – 41; and col. 12, lines 6 – 30).

Therefore, it would have been prima facie obvious to combine Sevick-Muraca with the teachings of Ntziachristos to include creation of voxels in a cost-efficient manner.

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**Regarding claims 6 – 9 and 16 – 20**, see Sevick-Muraca (col. 4, line 51 – col. 15, line 55) and Ntziachristos (col. 3, line 16 – col. 4, line 58; and col. 12, line 45 – col. 21, line 62).

**Regarding Claim 10**, Ntziachristos presents a cost-efficient embodiment of his invention, with which one can collect bulk information, using economical, massively parallel continuous-wave measurements (~1000 channels); and highly specific information of absorption and scattering parameters, using smaller array of time-domain source-detection channels (~50 – 100 channels) (col. 12, lines 6 – 30).

**Regarding claims 35 – 40**, see Ntziachristos (**fig. 2A**, col. 12, lines 45 – col. 18, line 67)

3. *Claims 11 – 15 and 21 – 25 are rejected under 35 USC 103(a) as being over Sevick-Muraca et al. (US 5,865,754) in view of Baron ((US 5,867,250), further in view of Ntziachristos et al. (6,615,063 B1), as applied to claims 5 and 10 above; even further in view of Bruder et al. (7,263,157 B2).*

**Regarding claims 11 – 15 and 21 – 25**, Sevick-Muraca in view of Baron in further view of Ntziachristos discloses a method for obtaining a three-dimensional representation of a light source distribution inside a mammal, as explained above.

Sevick-Muraca in view of Baron in further view of Ntziachristos differs from claims 11 – 15 and 21 – 25 in that Sevick-Muraca in view of Baron in further view of Ntziachristos does not specifically disclose details a cost function that is useful in optimizing the retrieval or measurement of surface photon density.

However, Bruder teaches the use of a cost function that is a sum of weighted addends. Each addend can be formed from the difference of a measurement value associated with the

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detector and a mapping function, the mapping function describing the connection between a theoretical measurement value of the reference position of the reference object mapped in the detector dependent on the reference position, the geometry of both acquisition systems, the rotation angle position and the system angle to be optimized. The specification of the mapping function preferably results in the form of fan geometry coordinates (col. 2, line 41 through col. 3, line 30).

Based on the mapping function, a cost function can be formed and minimized or optimized such that reference position(s) of a reference object and system angles can be determined. The optimization of the cost function can be achieved by standard methods that are commonly known; such as the Simplex Method, and other algorithms or optimization methods, utilizing linear ordinary differential equations (for example, Green's function and Finite Element Modeling) (col. 3, lines 50 – col. 7, line 3).

Bruder also teaches a tomography apparatus with at least two acquisition systems are respectively each disposed in the azimuthal direction at respective specific system angles around a common rotation axis. This enables artifact-free reconstruction of a slice or volume image using the system angles determined in this manner (Abstract).

Therefore, it would have been prima facie obvious to modify Sevic-Muraca in view of Baron in further view of Ntziachristos with the teachings of with Bruder to include optimization methods to obtain a more accurate and error free representation of a mammal.

***Response to Arguments***

Applicant's arguments with respect to amended Claim 1 have been fully considered but are not persuasive.

Applicant argues that Sevvick-Muraca does not obtain “a topographical surface representation of the mammal,” as recited in Claim 1, for the reasons present in paragraph 1 on page 8 of Remarks. Examiner respectfully disagrees and directs Applicant to the passage in *col. 7, lines 49 – 53*, where Sevvick-Muraca also explains that there is “an embedded, heterogeneity” (**fig. 3, 302**) hidden in the same phantom background mentioned by Applicant. Therefore, Sevvick-Muraca suggests obtaining a surface topography of a mammal, as Applicant asserts Sevvick-Muraca must do.

With respect to the amended feature, “using a processing system, reconstructing a three-dimensional representation of the light source distribution internal to the “mammal using the topographical surface representation and the surface light emission data,” Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection. Please refer to the rejection of claim 1 for details on how prior art teaches or suggests the amended feature “using a processing system, reconstructing a three-dimensional representation of the light source distribution internal to the mammal using the topographical surface representation and the surface light emission data.”

Applicant's arguments with respect to the rejections of 5 - 25 and 35 - 40 are moot in view of the grounds of rejections of Claim 1, which were required in light of the amendment(s) to the parent Claim 1.



***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to VANI GUPTA whose telephone number is (571)270-5042. The examiner can normally be reached on Monday - Friday (8:30 am - 5:30 pm; EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on 571-272-2083. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/V. G./

Examiner, Art Unit 3768

/Long V Le/

Supervisory Patent Examiner, Art Unit 3768